TORREYA

March, 1914.

Vol. 14 No. 3

SOME FOSSIL LEAVES AND THEIR SIGNIFICANCE

By Edwin W. Humphreys

Anything that will shed light, however feeble, upon the life processes of the past in their relation to those of the present is always of interest; hence, when certain abnormal fossil leaves are found which show the same aberrations that living ones of, apparently, the same genus possess, that fact seems to be worthy of record.

In the American Naturalist for 1907,* there are three articles on the development of pinnate leaves as shown by examples of arrested development in mature leaves of living plants. The occurrence of similar forms among fossil leaves and their significance is the subject of this paper.

In Lesquereux's Flora of the Dakota Group† two specimens of fossil *Rhus* leaves (*Rhus Powelliana* Lesq.) are figured, in one of which, reproduced on plate *A*, fig. 1, *a*, the terminal leaflet has reached a stage of development similar to that shown by the terminal leaflet of the living *Rhus glabra* L. (pl. *A*, fig. 1, *b*). The other (pl. *A*, fig. 2, *a*) shows a stage like that of the sumac leaf depicted in pl. *A*, fig. 2, *b*. There is, however, a more advanced stage of development portrayed in the leaf represented in pl. *A*, fig. 1, *a*, for some of the lateral leaflets are lobed; one of them, in fact, showing a distinct leaflet. In this case, the primary leaflets seem to exhibit a tendency to become pinnate, thereby foreshadowing the formation of a bipinnate leaf. Fig. 1, *c* is a drawing of a portion of a leaf of *Rhus glabra* L. showing a similar stage of development.

There is another species of fossil *Rhus*, *R. Uddeni* Lesq. (pl. *A*,

* F. T. Lewis, Am. Nat. 41: 431, 701, 817. 1907.

† Mon. U. S. Geol. Survey 17: 155. *pl. 56, figs. 4–5.* 1892.

[No. 2, Vol. 14, of Torreya, comprising pp. 21–38, was issued 9 February, 1914]

fig. 3), from the Dakota Group* which shows a lobed terminal leaflet. This species has a petiole that is partly winged, suggesting *Rhus copallina* L.

Thus, there would seem to be two species of fossil *Rhus* leaves whose method of development was similar to that of the living *Rhus glabra* L. and *Rhus copallina* L. and, therefore, basifugal.

Another species which presents an interesting example of arrested leaf development is *Negundo triloba* Newb.† (pl. *A*, fig. 4, *a*) from the Fort Union Group. This leaf has a lobed terminal leaflet that is almost wholly split off, suggesting a basifugal tendency such as can be found in the living *Acer Negundo* (pl. *A*, fig. 4, *b*).

In the same work (pl. 30, fig. 2) a specimen of the fossil species *Sapindus membranaceus* Newb., is figured, which shows a lateral leaflet completely split from the terminal one (pl. *B*, fig. 1, *a*). An investigation of the specimens of *Sapindus* in the herbarium of the New York Botanical Garden revealed some leaves of *Sapindus saponaria* L. in which the terminal leaflet had split to form a new lateral (pl. *B*, fig. 1, *b*). Here again is a case of a living form and a fossil form of apparently the same genus developing their leaves in the same way.

In Fontaine's Potomac or Younger Mesozoic Flora‡ several leaves are figured whose affinity to *Sapindus* is indicated by the generic name *Sapindopsis*. Certain leaves of this genus, belonging to two different species (*S. variabilis* Font. and *S. magnifolia* Font.) exhibit lobed terminals in various stages of development (see pl. *B*, figs. 2, *a* and 2, *b*). In fact, a short though incomplete series of the figured leaves of *Sapindopsis variabilis* Font. might be arranged to show the successive steps in the formation of the lateral leaflets from the terminal leaflet.

A further search of paleobotanical literature and of duplicate specimens of fossil plants would doubtless disclose many other interesting examples.

* Mon. U. S. Geol. Survey **17**: 154. *pl. 57, fig. 2.* 1892.

† Newberry, Mon. U. S. Geol. Survey **35**: 115. *pl. 31, fig. 5.* 1898.

‡ Mon. U. S. Geol. Survey, **15**: 297, *pl. 151, figs. 2, 3; pl. 152, figs. 2, 3; pl. 153, fig. 2; pl. 154, figs. 1, 5; pl. 155, fig. 6:* 298, *pl. 151, fig. 1; pl. 152, figs. 1–4; pl. 153, fig. 3; pl. 154, figs. 2–4; pl. 155, figs. 2–5.* 1889.

It had been hoped that similarity in development might serve as an aid in the identification of fossil leaves of the forms discussed. That is to say, if the fossil pinnate leaf did not develop in a manner similar to its nearest living relative, it would furnish a warning to review the identification. Goebel,* however, states that ". . . the course of development in nearly allied plants varies, for example, in pinnate leaves it is sometimes acropetal and sometimes basipetal." It is, however, suggestive that in two of the cases here noted, *Negundo* and *Sapindus*, the lobing of the terminal leaflet was first noticed in the fossil species and that this resulted in a successful search for similar examples among the related living forms.

The unsymmetrical outline of certain terminal leaflets from which a lobe has split, such as is well shown in the terminal leaflet on pl. *B*, fig. 1, *a*, does, however, offer a suggestion to those engaged in identifying fossil leaves. Should such a fossil leaflet, minus its lobe, be preserved alone, the tendency would likely be to regard it as a simple leaf, rather than as a leaflet of a compound leaf. Hence, in endeavoring to determine the probable relationship of any such unsymmetrical leaf, it might be advisable to consider whether or not it could be a leaflet of a compound leaf.

Briefly then the leaves under discussion show: (1) that like forms of leaves, of arrested development, occur in certain species of living and fossil plants of the same genus; (2) that these forms indicate that similar methods of leaf development took place in each of them; (3) that if "nearly allied" plants may develop their leaves in different ways, it follows that the mode of development is of questionable value to paleobotanists in identifying forms of arrested development among fossil pinnate leaves; (4) that in identifying simple fossil leaves of the form of the terminal shown on pl. *B*, fig. 1, *a*, if the lobe were not preserved, it might be advisable to view it as a possible leaflet of a pinnate leaf.

* Organography of Plants, authorized English edition, pt. 2, p. 330. 1905.

EXPLANATION OF PLATES

Plate A

Fig. 1a. ***Rhus Powelliana*** Lesq. showing lobed terminal leaflet, and on the right a lobed lateral. On the left is a lateral from which has split a secondary leaflet.

Fig. 1b. ***Rhus glabra*** L. showing lobed terminal leaflet similar to that shown in fig. *1a.*

Fig. 1c. Two lateral leaflets of ***Rhus glabra*** L. On the left a secondary lateral is shown, on the right a lobed lateral.

Fig. 2a. ***Rhus Powelliana*** Lesq. showing lobed terminal.

Fig. 2b. ***Rhus glabra*** L. showing terminal leaflet like that in *fig. 2a.*

Fig. 3. ***Rhus Uddeni*** Lesq. showing lobed terminal leaflet.

Fig. 4a. ***Negundo triloba*** Newb. showing a terminal leaflet lobed on the left side.

Fig. 4c. ***Acer Negundo*** L. showing lobe similar to that in fig. *4a.*

Plate B

Fig. 1a. ***Sapindus membranaceus*** Newb. showing lateral leaflet split from terminal leaflet.

Fig. 1b. ***Sapindus saponaria*** L. showing terminal leaflet from which a lateral leaflet has split.

Fig. 2a. ***Sapindopsis variabilis*** Font. showing lobed terminal leaflet.

Fig. 2b. ***Sapindopsis magnifolia*** Font. showing lateral leaflet split from terminal.

1913 NOTES ON THE FLORA OF COPAKE FALLS, N. Y.

BY SERENO STETSON

The growing season at Copake during the past year came fully up to expectations. On account of the comparatively little snow that fell during the winter months (1912–13) some concern was felt for the spring flora, but a visit on April 22 allayed all fears in that direction. There was a profusion of young growth and *Tussilago Farfara* L., *Trillium erectum* L., *Sanguinaria canadensis* L. with numerous representatives of *Viola* were flowering in large numbers, and there was no sign of the herbage in general having suffered from the failure of the snow blanket.

The next visit covered May 17 and 18 and furnished several surprises. While working the western slopes of Cedar mountain